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ABSTRACT

This document summarizes the proceedings from a 3-day conference about arts education technology. Presenters addressed both the promise and uncertainty of new and emerging technologies. There was an overriding concern for students and teachers, the human element of education that technology should serve. Day 1 consisted of the opening session "From Here to 2000: Education and Technology" followed by two special presentations, "Visions of the Future" and "Producing Arts with Technology." On the second day, the general sessions addressed interactive hypermedia and the educational possibilities presented by new multimedia technology. There were panel presentations concerning multimedia and arts education including a videodisc music series, and a Shakespeare project. The afternoon sessions addressed such issues as discipline based art education and multimedia, the future of arts education and the National Endowment for the Arts (NEA), and learning through drama. The third day's general session addressed technology's impact on children. This was followed by 10 sessions where experts from various arts disciplines discussed technological applications in their fields, for example: studio art teaching, music education software, and teaching, preparing schools for technology, and technology with limited school budgets. The luncheon session addressed the power of the imagination and the closing session dwelled on partnerships for educational technology. (KM)

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FUTURE TENSE:

ARTS EDUCATION TECHNOLOGY

CONFERENCE SUMMARY

AN INVITATIONAL
CONFERENCE
SPONSORED BY
THE GETTY CENTER
FOR EDUCATION
IN THE ARTS

JANUARY 24-26,
1991
LOS ANGELES

U.S. DEPARTMENT OF EDUCATION
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FOREWORD

CONFERENCE SUMMARY

From January 24 to 26, 1991, the Getty Center for Education in the Arts was pleased to host its third national invitational conference, "Future Tense: Arts Education Technology." Over 800 leaders and practitioners in education, the arts, and technology convened in Los Angeles for this two-and-a-half-day event.

Our interest in sponsoring "Future Tense" was based on a belief that the arts play a significant role in emerging technologies, which have the potential to influence and perhaps expand the scope of education as we know it today. Our research in preparation for the conference revealed the significant impact of the visual and performing arts in the development of instructional programs presented by computers, interactive videodiscs, long-distance learning, high-definition television, and other technologies. Technology and arts education seemed to have multiple complementary relationships.

In designing the event, our intent was to create an eclectic program that would appeal to the audience's diverse interests and levels of experience with new technologies. Presenters included technology developers, artists, classroom teachers, government and industry representatives, museum educators, university professors, and school administrators who shared their unique perspectives on technology's relationships to arts education.

As the "Future Tense" title suggests, presenters addressed both the promise and uncertainty of new and emerging technologies. In addition, they introduced an array of available programs, hardware, and exciting prototypes, and speculated about what may be on the horizon for arts education.

Against this backdrop of innovative programs and ideas, we offer this summary with an overriding concern for students and teachers, the human element of education that technology should serve. As several presenters convincingly illustrated, technology cannot replace effective teaching or meaningful experiences with the arts; it is simply a tool that, if used wisely, can empower teachers and students to explore and enhance their learning about the arts in exciting new ways.

If you find the following summary interesting and of use, we hope that you will request a copy of a more complete version of the proceedings on computer diskette by mailing in the request card at the back of this publication.

Leilani Lattin Duke
Director
The Getty Center for Education in the Arts
Summer 1991

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INTRODUCTION

The twenty-seven session summaries that follow are designed to convey the range and variety of "Future Tense: Arts Education Technology" and to highlight some of the particulars of that benchmark conference. For two-and-a-half days, conference-goers convened in Los Angeles to witness and learn about the ways in which new technology is being applied to arts education. They also heard about how the arts — including artists and art educators — are in turn shaping technological developments.

The brevity of these summaries cannot do justice to the thoughtfulness and insight of the speakers who made "Future Tense" so memorable. (Specific details are contained in a more complete version of the conference proceedings available on computer diskette; an order form is attached at the end of this volume.) In addition, the conference environment was as much a part of the event as the sessions themselves — twenty hardware and software exhibits, large-screen images, and computer-generated graphics and synthesized voices — all contributed to creating a "garden of electronic delights." In this context, nearly sixty keynote speakers, panelists, and product demonstrators elaborated on the technological revolution that the silicon chip launched and that many arts educators are learning to apply in classrooms throughout the country.

From interactive computer programs to multimedia capabilities incorporating text, sound, images, and movement, demonstrations of the new technology underscored its power to engage students — through its immediacy, its opportunities for self-guided discovery, its endowment of students with control over the pace and path of their learning, and its ability to transport students across the boundaries of language, culture, time, and space. For all that is desirable about this, however, the cautionary note struck by Harold Williams, president of the J. Paul Getty Trust, rang true: "Unless arts education assumes a more substantive role in the curriculum for all children, technology, no matter how sophisticated, will not represent any advantage." For many in the audience, including teachers from schools where diminished budgets have made the new technology only a dream, Williams's point could not have been more timely.

In light of the complexity of many of the issues raised in Los Angeles, what follows might best be regarded as a sampler of the fare that "Future Tense" offered. Like the conference itself, it should not be consumed whole or uncritically, but rather used to pinpoint ideas, speakers, and topics of interest that can then be explored more fully with the complete proceedings.

"A year's worth of experience in a few days," was how one district art coordinator summed up the pace of the conference and its array of speakers, technology, information, and experiences. These session summaries bear her out. The challenge for educators will lie not only in absorbing this vast universe of educational technology, but in keeping abreast of the rapid changes in the field.

DAY ONE

FUTURE TENSE: ARTS EDUCATION TECHNOLOGY

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WELCOME

SPEAKER: *Leilani Lattin Duke, Director, Getty Center for Education in the Arts*

Leilani Duke regarded this convocation of leaders in the arts, education, and technology as a benchmark in the Getty Center's effort to educate children in the arts. As its title, "Future Tense," suggested, the conference represented both the promise and the challenges facing educators as they grapple with technology. Because computers, videodiscs, and satellites can make works of art, artists' working techniques, and performances available to students anywhere in the world, new technology can further the Center's holistic, comprehensive, and culturally diverse approach to the arts. Such technology also makes it more likely that we can hold the interest of children raised on "Sesame Street" and Nintendo and, at the same time, encourage active learning.

However, there are also problems with uncritically embracing technology as a solution to educational problems. The hardware and software required can be expensive, and questions of equity and availability must be addressed to ensure that the educational gap between rich and poor school districts does not grow wider. It is also clear that truly integrating computer learning into the curriculum will require a drastic revision of conventional teaching methods and will depend on teacher receptivity and the availability of high-quality educational software.

While convinced of the great potential of electronic media, Duke expressed the belief that no computer program could replace a committed teacher. Duke urged the participants to keep this in mind as they sampled the electronic array before them, noting that it is necessary for educators to manipulate this technology usefully, rather than to allow the equipment to master them.

FROM HERE TO 2000: EDUCATION AND TECHNOLOGY (KEYNOTE SESSION)

SPEAKERS: *Lucie J. Fjeldstad, IBM Vice President and President, Multimedia and Education Division*

James A. Mecklenburger, Director, Institute for the Transfer of Technology to Education, National School Boards Association

MODERATOR: *Valsin A. Marmillion, President, Pacific Visions Communications, Inc.*

IBM is committed to encouraging partnerships among industry, government, and educators that will produce new and better educational opportunities for all students. Lucie Fjeldstad was convinced that the new multimedia technologies exhibited at the conference will have a profound impact on the future of education.

Every advance in communications technology serves to empower individuals, making information available to larger groups of people while overcoming the conventional limits of time and space. But the

potential for empowerment that multimedia technology represents has to be understood in the context of an educational crisis, in which 27 million Americans are functionally illiterate and 3,000 students drop out of school every day. Fjeldstad believed that multimedia technology "mirrors the way in which the human mind thinks, learns, and remembers" and could more effectively hold the attention of today's students — a belief that has been confirmed by studies showing that multimedia instruction can increase students' performance by as much as 50 percent.

To provide some context for the term "multimedia," James Mecklenburger showed a four-minute multimedia video production that introduced his organization, the Institute for the Transfer of Technology to Education (ITTE), which is part of the National School Boards Association. Multimedia, a blending of still images, sound, computer graphics, voice, music, and text, is a new and more effective way of doing what teachers have always done with chalkboards, lectures, and textbooks. Unfortunately, this new technology is reaching fewer than 10 to 20 percent of students as schools continue to be rooted in the nineteenth century. The price of neglect in this area — reflected in unemployment, welfare, crime, and prison costs — is already high. Mecklenburger asserted that large-scale, government-sponsored action, of the kind that created mass public education a hundred years ago, will be necessary to implement the knowledge and technologies that are now available.

The computer industry and communications companies are now leading the way in applying technology to education; if present trends hold, electronic instruction will be shaped by the private sector, not by America's professional educators. For Mecklenburger, the challenge for the education profession in the 1990s will be to develop policies, practices, and institutions that draw upon new technology for mass education, while shaping the ways in which that technology is used.

VISIONS OF THE FUTURE

SPEAKERS: *Alan C. Kay, Apple Fellow, Apple Computer, Inc.*

Martin Lamb, Research Associate, Computer Systems Research Institute, University of Toronto

MODERATOR: *Samuel F. Howe, Director of Educational Technology, Simon & Schuster Education Group*

Samuel F. Howe introduced the session's two speakers as visionaries committed to increasing the power of teachers, both in their ability to personalize instruction and in their effectiveness in tailoring instruction to the needs and learning styles of individual students.

Alan Kay, a developer of the Apple computer and the "mouse," proposed that three key dilemmas need to be addressed to avoid uncritically embracing electronic learning. The first is the assumption that purchasing equipment solves educational problems. Learning is a human ability that can be amplified by technology only if skilled instructors, a stable environment, and strong parental involvement are in place to nurture the learning impulse within the student. Kay proposed that before educators invest in technology, they consider the value system in which the technology will function.

The second dilemma is that discussions of technology often favor one mode of learning and neglect to consider how people learn through a combination of processes. While much electronic learning relies heavily on the visual faculties, iconic ability must be augmented with context and meaning. Students must be engaged and challenged on all levels if true learning is to take place.

The third dilemma of electronic education is that it takes considerable time before all the uses and ramifications of the new technology can be explored. Unfortunately, much of the effort now being spent developing programs for desktop computers will be obsolete as smaller (perhaps as small as a wristwatch), more powerful computers are developed.

Kay is currently involved with "The Vivarium Program," a holistic learning project in the Open Magnet School in Los Angeles. Here the children engage in a range of physical and intellectual projects, from designing and building a model city with communication, sanitation, and transportation systems, to staging and performing an opera, to creating a garden. These projects teach timing, coordination, problem-solving, and social skills, giving children a sense of accomplishment and pride in their work while preparing them for the complexities and demands of the adult world. The Open Magnet School uses computers as part of its curriculum, as problem-solving tools to help accomplish particular tasks. However, Kay concluded by reminding the audience that the best weapon for overcoming the problems of education is not a computer but "the one between our ears . . . provided it is loaded."

Following Kay's address, Martin Lamb demonstrated his computer program *MENULAY*, one that allows students and teachers to create their own multimedia projects, combining pictures, music, animation, speech, sound effects, and text through a selection of programming "tools." Because *MENULAY* can be accessed through a network of linked work stations, students can devote themselves to a project's art component in the art classroom, the music component in the music classroom, and so forth. In the same way, students can also utilize these components in their study of other subjects, such as history or math.

MENULAY facilitates art and music education by giving even young students the ability to compose music or animate their own drawings immediately, with little prior knowledge. They can combine the visual and aural material, assigning colors to sounds and altering the "shapes" of notes on the screen. Novice composers are able to produce fairly complex multimedia works, and one professional composer has even won an international competition with a piece produced on *MENULAY*. Lamb believes that *MENULAY* offers an example of what happens when the skill barrier is removed from the creative process, giving both children and adults more confidence in their own innate creativity.

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DAY ONE

PRODUCING ARTS WITH TECHNOLOGY

SPEAKERS: *Tod Machover, Associate Professor of Music and Media, The Media Laboratory, Massachusetts Institute of Technology*

Vibeke Sorensen, Director, Computer Animation Laboratory, School of Film and Video, California Institute of the Arts

MODERATOR: *Morton Subotnick, Director, Center for Experiments in Art, Information and Technology, California Institute of the Arts*

Morton Subotnick noted that although few people are aware of it, musicians have been closely involved in monitoring and nourishing the growth of technology. As performers and composers, they have redefined the meaning and nature of their medium, even to the point of creating "intelligent" instruments that function beyond the immediate control of the composer or performer. His own work involves synthesized words and music that are activated by keyboard, layered video images, live performers, and even an "air drum" that turns performers' movements into sounds.

The son of a concert pianist and a computer-graphics pioneer, Tod Machover gravitated naturally toward fusing art and technology. Given his preference for combining divergent styles into an overall unity, he has found that technology can serve as a powerful — and neutral — tool for binding contrasting material.

Machover is committed to using technology to "enhance human expression and creativity." His recent work has included amplifying human gesture by "fingerpainting" with sound, which he illustrated with a video that showed him conducting three musicians while wearing a "data glove." The glove translated his movements to a computer, thereby "coloring" the performance of the guitarists and percussionist. Machover observed that his projects require the collaboration of a number of committed and experienced people who understand both technology and music, and he predicted that artists of the future will expand such collaborations.

Although she began her professional training in architecture, Vibeke Sorensen discovered that she wanted to make the forms "move," and so began to experiment with video and electronic animation. Sorensen showed slides of her present and past work, which combine video effects, music, and voices emanating from multiple monitors. To retain an element of the human gesture, Sorensen has hand-painted some of her animation cycles or used a camera as if it were a paintbrush. Convinced that the only way artists will influence technological change is by direct involvement, Sorensen suggested that "artists transform themselves, their media, and their environment" and become role models for students and catalysts for the future.

DAY TWO

FUTURE TENSE: ARTS EDUCATION TECHNOLOGY

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INTERACTIVE HYPERMEDIA AND THE NEW EMPOWERMENT TOOLS

SPEAKERS: *Robert Winter, Consultant, The Voyager Company*

Robert Abel, President, Synapse Technologies, Inc.

Allen De Bevoise and Morgan Newman, President and Vice President, AND Communications, Inc.

MODERATOR: *Kristina Hooper Woolsey, Director, Apple Computer, Inc., Multimedia Lab*

Citing Montessori's exhortation to educators to "follow the child," Kristina Woolsey explained that she and her coworkers at Apple Computer, Inc. had decided to tackle the problem of learning from children by observing how children create. She showed a short videotape of the Apple Multimedia Lab's workshop for children at the International Design Conference in Aspen, Colorado, where student and adult designers used interactive technology to create their own multimedia productions, including self-portraits, texts, vital statistics, images, and works of art.

The other presenters were also engaged in developing interactive educational programs that can empower students of any age and skill level in their understanding of art. Robert Winter, Professor of Music at the University of California, Los Angeles, representing the Voyager Co., focused on last year's development of an interactive multimedia compact disc devoted to Beethoven's *Ninth Symphony* that enables users to access the work at several levels, including musical, historical, cultural, and political. Unlike a written text, the program is nonlinear and self-directed, allowing users to get immediate information on a specific passage of music or historical item "at the click of a mouse." An even more extensive program, devoted to

Stravinsky's *Rite of Spring*, also progresses from elementary concepts to more complicated ones and can be accessed at any educational or skill level. Dissolving the boundary between education and entertainment, Winter believes, is the way to engage both children and adults in the learning process.

The experience of visiting an exhibition of David Hockney's work while listening to a recorded analysis by the artist himself inspired Robert Abel and his partners to develop their interactive program devoted to Picasso's *Guernica*. In the program, an image of the painting, which is Picasso's interpretation of a German attack on a Spanish town during the Spanish Civil War, is accompanied by a series of "tools" that allows users to ask questions and get information on a number of levels. They can locate the painting and the actual incident it depicts on a time line, get a comment from the artist or from an eyewitness to the actual event, read formal evaluations of the painting and its place in Picasso's career, or hear an interpretation of the entire work from one of several experts. By mixing formal, contextual, art historical, and aesthetic material, the program allows its users to interact with a major work of art at different levels, according to individual interest and ability.

Morgan Newman and Allen De Bevoise were asked by IBM to work on a similar project utilizing a written text. The text chosen was Tennyson's "Ulysses," and an elaborate system of notation was created for it. The program includes a dictionary of all of the words used in the poem and offers descriptions of the several contexts in which the poem can be placed, including Greek mythology, nineteenth-century English literature, the historical conditions of the poem's production, its place in the overall literary output of Tennyson, and the general social and cultural milieu of nineteenth-century Britain. Contrasting dramatic readings and scholarly interpretations are provided, and an individualized, close reading can be undertaken by the student by requesting more information on specific allusions and references within the poem. The goal of this kind of customized textual exploration is to provide students with the tools to perform their own analysis of complicated texts.

THE MANY FACES OF INTERACTIVE

SPEAKER: *Stan Cornyn, President, Warner New Media*

RESPONDER: *Peter Bloch, President, Interactive Arts*

This session explored the educational possibilities presented by new multimedia technology. While the impressive potential of various systems was demonstrated by Cornyn and his associates, both speakers emphasized that educators need to become more active in the development of media systems, because choices made during research and development will dramatically affect the possibilities for using technology in the classroom. To this end, Cornyn and Bloch challenged educators to become more technologically articulate and begin to work directly with corporations to produce media systems that meet the needs of students and teachers alike. Bloch noted that compatibility between software and hardware, and among various media, is essential for effective classroom use of the new technology; yet the industry lacks useful standards and often fails to comprehend educators' needs.

Cornyn announced that several new systems, which combine digital audio and video to allow viewers to interact with various layers of information and output, would soon be available to the public. These will make it possible to produce affordable, flexible, and engaging combinations of learning and play. Manufacturers remain uncertain which directions to take in developing these systems, because market research indicates that while adults generally choose to interact passively with media, students often prefer to interact much more actively with complex new systems. Bloch added that manufacturers generally have produced systems they think the market will bear without asking for input from software developers, who are then presented with a "bewildering array of possibilities." Both Bloch and Cornyn asserted that educators need to band together to convey their opinions and ideas to manufacturers, rather than allowing the industry to interpret the market for them.

PANEL PRESENTATIONS: MULTIMEDIA AND ARTS EDUCATON

PODIUM AND THE UNIVERSITY OF DELAWARE "VIDEODISC MUSIC SERIES" (Panel 1)

PANELISTS: *Fred T. Hofstetter, Associate Provost, Academic Computing and Instructional Technology, University of Delaware*

Larry Peterson, Publisher, Music Disc News

Hofstetter and Peterson demonstrated the remarkable flexibility and multimedia capabilities of digital technology, including videodisc and interactive computer software. Digital audio, coupled with visual input, improves many students' ability to comprehend elements of music that are often difficult for novice listeners. The ability to store and recall vast amounts of varied data on videodiscs or computer hard drives enables students to focus, both aurally and visually, on a specific aspect of music, such as melody, texture, or harmony. While the use of laserdisc technology is extremely popular with students in music appreciation courses at the University of Delaware, many educators have been slow to incorporate such systems into their teaching.

Educators are apparently impressed with multimedia technologies but remain uncertain about how best to use them to create their own curriculum materials. Interactive computer programs, such as IBM's *Podium*, may help educators master and manipulate multimedia systems while providing unprecedented flexibility in the design of classroom aids. Such software can link digital images and audio with other computer applications and allows a degree of information and presentation control that Peterson described as "hyper-lecturing."

PALENQUE AND THE MUSEUM EDUCATION CONSORTIUM DISC (Panel 2)

PANELISTS: *Kathleen S. Wilson, Multimedia Director/ Media Designer, Center for Children and Technology, Bank Street College of Education*

Danielle Rice, Curator of Education, Philadelphia Museum of Art; Chair, Museum Education Consortium

Palenque and the Museum Education Consortium disc represent two multimedia research and development projects that emphasize learning through discovery and that share certain design characteristics. These projects use interactive technology to teach "the skills of looking" that are required to appreciate a museum's offerings.

Palenque, a digital, video-interactive, multimedia prototype, addresses the needs of a public whose limited contact with arts education has not diminished their desire for greater knowledge of art. The prototype attempts to introduce users to new ways of looking at and reflecting upon original works of art, to provide easy access to several layers of information, to pique their curiosity, and to foster engaged exploration of aesthetic experiences.

Palenque's child narrator introduces the Maya city and demonstrates how the program can be used to explore the ancient Maya culture. The narrator explains the various options available and invites the user to make choices among them while "traveling" through the program. The narrator is also available to provide advice and to offer suggestions.

Like *Palenque*, the Museum Education Consortium disc is an interactive video prototype for museum visitors based upon extensive content, image, and film research and utilizing high-resolution video and digital imaging. The program's database contains approximately 1,200 images of paintings, drawings, preliminary sketches, and sculptures. A related program for art educators shares the same database as the museum visitors project but provides users with greater research tools and opportunities to create and edit presentation files. Both programs are presently being tested and evaluated by the seven consortium-member museums.

THE SHAKESPEARE PROJECT (Panel 3)

SPEAKER: *Larry Friedlander, Professor, Department of English, Stanford University*

Stanford University's *The Shakespeare Project* began five years ago as a vehicle for addressing new conceptual issues in multimedia. More important than the system's present capacity for providing students with information is its exploration of the various ways in which we come to understand a complex thing, such as theater. The project allows students to recognize that any performance from a Shakespearean play represents only one of many ways of playing a given scene. It encourages students to analyze what they see, rather than passively observing a performance, and helps them to understand how a work was originally made and how it could be remade in a different manner.

Friedlander's involvement with *The Shakespeare Project*, like his previous work on the multimedia system at London's reconstructed Globe Theatre, has stressed the possibilities of enriching literary and theatrical experience by enabling people to engage several layers of aesthetic, dramaturgical, historical, and intellectual information through the use of technology.

THE FUTURE OF ARTS EDUCATION/ THE NATIONAL ENDOWMENT FOR THE ARTS

SPEAKERS: *Harold M. Williams, President, The J. Paul Getty Trust*

John E. Frohnmayer, Chairman, the National Endowment for the Arts

Harold Williams spoke of the need for a collective commitment to advancing arts education in the context of a national educational reform process. He stressed that creative and critical thinking, reflection and interpretation — so vital to success in this "information age" — are precisely the sorts of skills and values developed through engagement with the arts. Yet, too often, the arts are relegated to the margins of the curriculum, and educators fail to recognize their relevance to the process of school reform. The Getty Trust is joined by many other organizations in seeking to move arts education to the center of American schooling, and it is actively working to foster parental support for enhanced arts curricula. Similarly, John Frohnmayer's tenure as chair of the NEA has found him at the center of a public debate over the importance of the arts, and to his credit, Williams said, he has steadfastly upheld arts education as a national priority.

In his remarks, John Frohnmayer emphasized that the arts can develop the mind in ways that ordinary language and everyday experience cannot. Arts education can unlock modes of understanding and expression that help us more fully appreciate the richness of the human experience and can have a positive effect even in subject areas not ostensibly related to the arts. For example, Frohnmayer suggested that as individuals develop from elementary command to expertise in the arts, their understanding and appreciation is at such a high level that it transfers from the area of the brain associated with aesthetics to the realm associated with scientific and mathematical ability. Likewise, expertise in the sciences and math move in the other direction, to the areas of the brain associated with aesthetic experiences.

Arts education has become a fundamental goal of the National Endowment for the Arts. The Endowment seeks to help citizens recognize and appreciate the value of art, encourages them to support arts education, and provides ways for them to participate in varieties of aesthetic experiences. Partnerships with state governments, with the educational and business communities, and with various arts organizations will play a significant part in realizing the goals of national arts education reform, Frohnmayer said. Any form of illiteracy is dehumanizing, and factors that exclude people from the realm of the arts are as troubling as those that hinder people's ability to read a book or a newspaper.

Frohnmayer concluded by stating that he sees the goals of all the different groups and individuals committed to arts education as converging, and he expressed the hope that greater cooperation and increased partnerships would help make their agendas consistent and compatible.

DISCIPLINE-BASED ART EDUCATION AND MULTIMEDIA

SPEAKER: *Kay Alexander, Art Education Consultant; Codirector, Curriculum Development Institute*

MODERATOR: *Phillip C. Dunn, Associate Professor of Art, University of South Carolina*

Phillip Dunn, who was a program officer for several years with the Getty Center, explained that discipline-based art education (DBAE) seeks to develop proficiency in the making, analyzing, comprehension, and appreciation of art through the four disciplines of studio/performance, art criticism, art history, and aesthetics. Given its multidisciplinary base and reliance on visual as well as textual data, DBAE is well-suited to interactive multimedia systems.

One Getty Center project, the Curriculum Development Institute, resulted in a sampler of DBAE lesson units written by art specialists and museum educators. Demonstrating one unit entitled "Many Ways of Seeing," developed as a prototype for interactive software, Kay Alexander demonstrated how its thematic sections —

ranging from an examination of originals, reproductions, and forgeries to an electronic mask-making exercise — engage students in explorations of key issues in art history, critical evaluation, ethics, aesthetics, and art production. The program offers a variety of support tools to teachers and allows them the flexibility to meet the needs of students of different ages and skill levels.

EXHIBITS AND TECHNOLOGY

SPEAKER: *Nancye Green, Partner, Donovan and Green*

Nancye Green and her partner-husband Michael Donovan believe that while they bring technological sophistication to the design and development of exhibition projects, technology is not the end-product of their efforts, but rather a means for integrating form and content. With this in mind, Green and Donovan have designed a number of exhibit spaces, ranging from a museum wing to the public exhibition space at the Ronald Reagan Presidential Library.

Using slides to illustrate her points as she made them, Green took conference participants on a visual "tour" of various approaches to exhibits and discussed their history. Arriving at the present, she observed that audiences of the 1990s are visually sophisticated and quite comfortable with fast-paced media displays that encourage non-narrative (or nonlinear) thinking. New high-technology exhibition techniques reflect the changing conceptions of the museum and its role as a cataloger, preserver, and teacher, as well as the audience's growing sophistication and involvement in the interpretive process. Institutions such as the Epcot Center and the Boston Children's Museum have used technology in ways that make a strong case for direct, first-hand experience and involvement, as opposed to "overloading" visitors with information.

Green insisted that it is the ability to have a primary experience that is still at the heart of the museum visit. Technology has merely provided new tools to reach out to audiences, drawing them in and broadening their perspectives while entertaining them.

DISTANCE LEARNING/SATELLITE CONFERENCE

SPEAKERS: *Kathleen P. Fulton, Analyst, Office of Technology Assessment, United States Congress*

Barry Rebo, President, REBO High Definition Studio, New York; Hollywood High Definition Resource Center, Los Angeles

MODERATOR: *Mits Kataoka, Associate Professor of Design, University of California, Los Angeles*

Kathleen Fulton explained that distance learning, or educational telecommunications, is simply the linking of students and teachers, regardless of location, through technology that permits them to interact. This means that students and teachers can be linked on-screen with people and materials not available in the traditional classroom. Through satellite technology, for example, students in Salt Lake City can participate in an oceanographic project on the East Coast, study rarely taught languages, or enroll in specialized courses, taking advantage of instruction far beyond the means of their individual schools. Teachers can also benefit by attending electronic "conferences" with other educational professionals without expensive and time-consuming travel.

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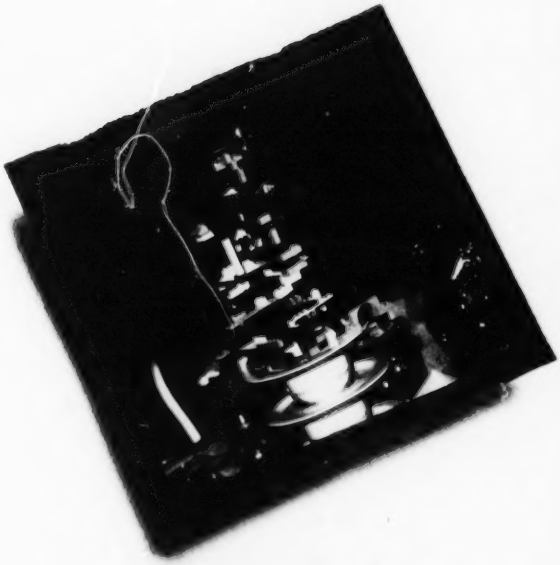
The United States Congress's Office of Technology Assessment recently completed a comprehensive study of long-distance learning and its benefits. Although Fulton believed that far more research was necessary, long-distance learning is clearly a fast-growing trend that is radically altering the traditional learning environment.

In Barry Rebo's field of high-definition television, the visual quality of 35-millimeter film and the audio quality of a compact disc have been combined in a system that is compatible with existing interactive educational programs. High-definition imaging has obvious advantages in arts education because it reproduces color, texture, and detail far more accurately than existing television, film, or video. Rebo was confident that it will be the "wave of the future" for medical conferencing, archives, and visual data banks as well.



LEARNING THROUGH DRAMA: *THE GATES OF TROY*

FACILITATORS: *Alistair Martin-Smith, University of Windsor; Belarie Hyman-Zatzman, University of Toronto; Maya Ishiura, Interplay Arts*

SOFTWARE DESIGNER: *Martin Lamb, University of Toronto*

This session demonstrated *The Gates of Troy*, a computer-supported reenactment of the Trojan War designed by Martin Lamb and Alistair Martin-Smith. The purpose of the demonstration was to explore the relationship of drama to learning and to use an interactive computer network to teach negotiation skills.

Participants were drawn from the conference audience and separated into groups representing the gods, the Greeks, and the Trojans. Each group was outfitted in togas and stationed in a separate room decorated in ancient motifs, with an interactive computer serving as their only contact with the other groups. Guided by the program designers, the participants engaged in role-playing exercises, followed by simulated negotiations with the gods and their mortal opponents. After several rounds of offers and counteroffers, a resolution was reached. *The Gates of Troy* used print, computers, video, and role playing to create a multilayered context for teaching the Trojan War, while simultaneously teaching conflict-resolution skills.

DAY THREE

FUTURE TENSE: ARTS EDUCATION TECHNOLOGY

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TECHNOLOGY'S IMPACT ON CHILDREN

SPEAKERS: *Samuel Y. Gibbon, Executive Director, Project in Science and Mathematics, Bank Street College of Education*

Patricia M. Greenfield, Professor of Developmental Psychology, University of California, Los Angeles

Robert W. Kubey, Assistant Professor of Communication, Rutgers University

MODERATOR: *Jan Hawkins, Director, Center for Children and Technology, Bank Street College of Education*

Jan Hawkins observed that the visual technologies that dominated the "Future Tense" conference raised the question of what children learn from them and whether repeated exposures make children "learn differently and have different minds."

There are benefits and drawbacks in using electronic learning, Samuel Gibbons asserted. One clear benefit in science education has been the way computers help children visualize processes in the natural world, such as the spatial relationship between the Earth and the sun as night becomes day. A serious drawback of the new technology is the extent to which conventional notions of reality are altered and distinctions between cause and effect are blurred. He suggested that children need to be given the intellectual tools to manipulate new media so that they do not become manipulated by them.

Patricia Greenfield was convinced that children's perceptual processes have changed as the result of exposure to electronic media. Given the heightened experience of visual imagery — through videotapes and games, films and television — a new type of art student is emerging, one who is spatially sophisticated and accustomed to discovery by doing rather than watching. Greenfield predicted that these students will create less from what they have experienced and more from what they have seen, a characteristically "postmodern" conception of creativity.

Robert Kubey, a professor of communications, reminded the participants that acquiring technology was not enough to ensure education: the technology must be mastered. He pointed out that two technological advances — film and television — have been available to schools for many years, yet still have not been fully used or understood.

Although Kubey believed it preferable that children learn to draw with real crayons before picking up "electronic crayons," he thought it clear that electronic media will become more, rather than less, pervasive in our children's lives. He was convinced that the best things schools could do for their students was to make them media literate, to help them interpret the mass media around them the same way they are assisted in interpreting written texts. Unfortunately, children's television programming is rife with violence and aggressive sexuality, as well as relentless propaganda for consumer goods. Television news has degenerated into sound bites and "shallow, sensationalized reporting." This situation must be rectified, Kubey said, and he proposed two fronts for attack: first, a concerted effort on the part of the Federal Communications Commission, Congress, and citizens to force the media to police themselves; and second, increased parental and school involvement in teaching children to become sophisticated media consumers.

STUDIO ART TEACHING: EARLY ELEMENTARY/MIDDLE SCHOOL (Session 1)

SPEAKERS: *Nancy Scali, Early Elementary Teacher, Arroyo School, Ontario, California*

Stephen C. Schneider, Digital Art Educator, Sherwood Alternative Middle School, Columbus, Ohio

Nancy Scali brought a display of studio art created by students from kindergarten through sixth grade. The artwork, computer-generated and handmade, included self-portraits, a fabric quilt made of heat-transferred computer drawings, and endangered species puppets created on the computer. She also brought a volume called *Art: The Telling of History Through Technology*, which included student re-creations of cave paintings, African masks, and Japanese scrolls made by computers or other instruments of modern technology.

Scali's class has been able to use computers to study the formal principles of painting by studying computer-generated copies of masterpieces and by manipulating and analyzing composition and color. The new technology makes such exercises effortless, whereas in the past they would have taken months of studio time. Using an Apple II GS and ImageWriter II, the computer technology employed by Scali's class is a remarkably cost-effective way to expand the creative potential of young artists. Scali concluded by reminding the participants that teachers are the key to enhancing the fine arts curriculum through the use of computer technology.

Stephen Schneider runs a special lab in the art department of a school with a strong concentration in the arts, math, and science. He has adapted discipline-based art education principles to the digital environment, teaching art history, aesthetics, criticism, and studio art using computer technology. Because the computer is such a quickly learned and "forgiving" medium, students are able to sketch, discard, and resketch rapidly, freeing them creatively.

Through computer portraiture and self-portraiture, the students learn things about themselves and their classmates, "limited only by their imagination and the software tools" at their disposal. Schneider has also adapted the computer laboratory to give students a multicultural art experience by using paintings and images from other cultures as inspiration.

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MUSIC EDUCATION SOFTWARE AND TEACHING (Session 2)

SPEAKERS: *Roger B. Dannenberg, Marta Sanchez, Annabelle Joseph, Project Team, Carnegie Mellon University, Pittsburgh, Pennsylvania*

This session demonstrated *Piano Tutor,* a program developed at Carnegie Mellon University to teach technical skills to students so that teachers can concentrate on other aspects of a work. The program evaluates student performance against a model, gives feedback, reveals errors, and suggests areas and goals for practice. Lesson material is presented through video, computer graphics, and synthesized music and is followed by a student performance, which the teacher then evaluates. Currently aimed at high school and college students, the program seeks to provide an individualized curriculum that progresses at the student's own pace. This frees the professional instructor to concentrate on higher-level teaching and on the more subtle aspects of a student's musical development.

PERFORMANCE ARTS TEACHING (Session 3)

SPEAKER: *Phillip W. Moss, Chairman, Creative and Performing Arts, University Liggett School, Grosse Pointe Woods, Michigan*

Phillip Moss is concerned with making the best use of the limited hardware available to him. Even the "lowly" telephone, for example, augmented with an inexpensive speakerphone, enables radio dramas to be performed with casts from two schools. Video can be used to supplement a play with a shortage of cast members by projecting scenes from a film version of the work into gaps in the production.

Moss recounted two projects that have employed simple technology to further arts education. Interested in the concept of "whole-brain" learning, he used both textual and visual material to teach *Hamlet,* and the play itself to teach history, performance, and production technique to seventh graders. For another project, *Hilberry Backstage Pass,* students from five schools, with support from the community, created their own series of videotapes documenting their preparations for the performance of a play. The series was picked up by cable television and run on instructional networks in other schools.

Moss concluded his presentation by demonstrating *Total School Management, Culture 1.0,* and *The Book Report,* three software programs he employs in his classroom.

PREPARING SCHOOLS FOR TECHNOLOGY
(Session 4)

SPEAKER: *John R. Phillipo, Director of Instructional Leadership and Technology, Merrimack Education Center, Chelmsford, Massachusetts*

With today's multimedia technology, teachers are freed from the constraints of textbooks and can transform information to meet the needs of their students in new ways. The challenge remains, however, to educate teachers in the ramifications and possibilities of this new instructional technology.

John Phillipo has been consulting with school boards around the country to help with budgetary planning and teacher-training programs to facilitate these changes while overcoming professional resistance. Advocating the integration of multimedia technology into the entire curriculum, Phillipo argued that it was more economical, as well as more effective, than traditional tools, such as filmstrips and other audio-visual aids. Today's students will have to access, analyze, and communicate information through computer technology, he said, and educators must begin now to help them acquire the skills necessary to do so.

COMPUTER GAMES
(Session 5)

SPEAKERS: *Lauren Elliot, Gene Portwood, Software Designers, The Learning Company, Fremont, California*

Lauren Elliot and Gene Portwood are the designers of an educationally oriented computer game for the home market called *Where in the World Is Carmen Sandiego?* Casting the player as a detective, the program provides clues to cities and countries where the villain has gone. Reference books, such as a Rand McNally atlas and desk encyclopedia, help the detective track down the criminal. Intended for the whole family, *Carmen Sandiego* uses film production methods, storyboards, character development, and continuity. The most recent version, *Carmen Deluxe,* has tripled the size of the database and uses state-of-the-art graphics and sounds, with photos from *National Geographic* and the Smithsonian Institution's collections. Since designing *Carmen,* Elliot and Portwood have developed other programs, such as *Science Tool Kit,* which "seriously educate in an entertaining way."

MULTICULTURAL EDUCATION
(Session 6)

SPEAKERS: *Corinne Nason, Codirector, Ojibwe Curriculum Crossroads Project, Deer River, Minnesota*

Yvonne M. Wilson, Elementary Education Teacher, North Elementary School, Talmoon, Minnesota

Corinne Nason and Yvonne M. Wilson are involved in creating a multicultural curriculum that aims at awareness of Ojibwe culture among Native and non-Native American students. Employing a hypermedia component on Ojibwe art and culture and an oral history project with Ojibwe elders, as well as storytelling and visits from Ojibwe artists, the project addresses the low self-esteem and high drop-out rates among Native American students. The program focuses on cooperative, child-centered, experienced-based learning. Students actively participate in writing and creating the curriculum, and their excitement translates into greater pride and motivation in their academic work.

TRAINING VISUAL AND PERFORMING ARTISTS THROUGH TECHNOLOGY
(Session 7)

SPEAKER: *Richard L. Loveless, Professor of Art Education, Director, Center for Innovative Technology for Educational Futures, University of South Florida*

Arguing for more diversity and collaboration and less specialization in performing arts training, Richard Loveless pointed out that the rigid distinctions between fields and disciplines are breaking down. As the director of the Technology Research Program at the University of South Florida, Loveless believes that technology should be seen as an "enabler" for artists and an enhancement to communication and creative freedom. His school's programs use computers and videos to help students explore their own creative processes, either as media in themselves, or as a means of analyzing their own art in other media, or as stimuli to self-expression. Using several technological media — such as computers, video, and synthesizers along with live dancers, musicians, and poets in a single work — has permitted students to engage in large-scale collaborations and to investigate "the interconnectedness of thought processes across traditional disciplines."

DEVELOPING MULTIMEDIA SUPPORT FOR A DBAE CURRICULUM
(Session 8)

SPEAKERS: *Kay Alexander, Art Education Consultant; Codirector, Curriculum Development Institute*

Ronald W. Nugent, Director, Nebraska Videodisc Design/Production Group

Lois R. Dam, Lead Instructional Systems Designer, Nebraska Videodisc Design/Production Group

Alexander, Nugent, and Dam demonstrated the process involved in developing a multimedia supplement to the "Many Ways of Seeing" instructional unit in the Getty Center's *DBAE: A Curriculum Sampler*. Images and materials are available on videodisc and can be accessed sequentially or randomly. The videodisc contains the text for a prototypical unit, entitled "Many Ways of Seeing," all the necessary visuals, and instructions for navigating through the program. Cost and availability of hardware were important considerations, and the program uses Hypercard, a videodisc player, and a color monitor.

Although intended as an interactive teaching tool, students can use some of the program's capabilities to create their own slide shows for reports. While this is a prototype and will not be commercially available, the program demonstrates the way technology can be used to enhance DBAE.

TECHNOLOGY WITH LIMITED SCHOOL BUDGETS (Session 9)

SPEAKER: *Greta S. Pruitt, Principal, Thirty-Second Street/University of Southern California School for the Visual and Performing Arts, Los Angeles*

Insisting that even schools with limited resources can make technology available to their students, Greta Pruitt presented a slide show that detailed how students at her elementary school are creating cassette books, radio plays, and videotapes while producing programs and flyers for their dramatic productions — all with limited resources. As an arts magnet school associated with the University of Southern California, the Thirty-Second Street School has strong community support for its multicultural arts mandate. Still, facilities are limited: there is no stage, auditorium or studio space for dance, art, or music classes. Nevertheless, with a talented faculty and simple technology, even first-graders are producing cassette plays and books, while older students produce and videotape their own multimedia productions.

By selling student projects, collaborating with local businesses, and entering contests and competitions, the school has raised money and acquired equipment and supplies. The students recently won a Macintosh computer, while the faculty won a Toshiba copier. Pruitt recommended that teachers be brought into the budget process, so that they are prepared to make a strong case for their projects when funds become available.

TECHNOLOGY IN DANCE EDUCATION (Session 10)

SPEAKER: *Shirley Ririe, Codirector, Ririe-Woodbury Dance Company, Salt Lake City, Utah*

Shirley Ririe and her partner, Joan Woodbury, have taken advantage of technological advances to present and teach dance in exciting ways. Most of their projects are done with little money and much imagination, such as enhancing dance with computer-generated slide images that may themselves provide the inspiration for a work. Another innovation is to have a camera operator videotape and instantly edit a perform ance, while projecting the edited version on screens behind the dancers. This highly spontaneous collaboration between the camera operator and the choreographer changes the nature of dance itself. Ririe carries these technological innovations into her teaching of young children. She has designed a beginning dance improvisation curriculum complete with videotapes and workbooks to help guide dance teachers while freeing them for more detailed instruction.

DAY THREE

THE POWER OF THE IMAGINATION

SPEAKERS: *Marty Sklar, President, Walt Disney Imagineering*

Luis Valdez, Writer/Director/Founder, El Teatro Campesino

As a former school-board member whose family is firmly rooted in the education profession, Marty Sklar represents a company deeply committed to education. Sklar explained that the term "imagineering" referred to the blend of imagination and technical knowledge that go into the great Disney creations. At Disney Imagineering, Sklar and 2,300 other "imagineers" produce new wonders for the three Disney theme parks.

Disney Imagineering is still inspired by Walt Disney's dreams, drive, and dedication to the challenge of combining imagination, technology, and design for entertainment. It is the conviction at Disney that the imagination supplies the magic. Technology is only a facilitator and must not interfere with a visitor's enjoyment of an attraction. If the technology is sufficiently hidden, visitors can experience other times and places without being aware of what produces the illusion.

The career of Luis Valdez has been one of the most distinguished in the American theater. Having founded El Teatro Campesino during the grape boycott of 1965, Valdez has since written many acclaimed *dramatos* (playlets) that highlight the plight of farm workers and urban Chicanos. Works to his credit include *Zoot Suit* and the film *La Bamba*.

Valdez realized early in his life, as a six-year-old farm laborer, that imagination and creativity had the power to overcome the hard life into which he had been born. He has committed his life to an idea that the Maya called "vibrant being" — the possibility of an individual reaching out and touching others, in his case through art. This can be accomplished through the beat of a drum, the vibrations in the colors of a painting, or the resonance of words spoken in a theater; all carry the vibrations of the conscious mind that created them. "We are all vibrating with one another and the earth," Valdez observed. For him, such technology as the integrated circuit is a metaphor for human communication and understanding. In this spirit, he urged America to open itself to the interconnectedness of Asian, African, Middle Eastern, European, Hispanic, and Native American cultures and to "get to know its own heart."

PARTNERSHIPS FOR EDUCATIONAL TECHNOLOGY

SPEAKERS: *W. P. Lipischak, Director, Centre for Curriculum Resources and Technologies, Ontario Ministry of Education*

Dick Lee, Coordinator, Computer Resources Department, Toronto Board of Education

W. P. Lipischak and Dick Lee provided a brief overview of Ontario and its school system. They then showed a video that illustrated the way computers are integrated into Ontario's primary and secondary schools. Innovation in educational computer technology over the last ten years has been assisted by a grassroots movement of "leading-edge teachers." They have forged partnerships with dealers, producers of software, and educators to create the Policy Advisory, Implementation, and School Committees to foster computer education. These partnerships have been bolstered by the establishment of formal support structures by the Toronto school board, and they continue to serve as the foundation of the educational technology initiatives in Canada today.

In discussing the Canadian model, W. P. Lipischak stressed the importance of staff development, noting that the most effective programs for training have been initiated at the school level by creative teachers. Dick Lee added that such training is not limited to the "how" of using technology, but also the "why." As a result of cooperative implementation projects in Canada's schools, the 175 Ontario school boards have a firm foundation for the integration of new technologies into the classroom.

CONCLUSION

Perhaps what these summaries demonstrate is that the new technology and its applications to arts education are like an artist's work in progress — imperfect, evolving, but already suggestive of the potential outcome. In taking participants to the technological frontier, "Future Tense" seemed to mark a spot that said to those present, "here is where we are now — not at the end of the journey but, in a sense, only at the beginning."

In fact, with luck, the end never arrives, leaving those who care about arts education to employ intelligently whatever tools are available. "We urge you to think critically about the meanings of what you are seeing, hearing, sensing and experiencing," Getty Center Director Leilani Lattin Duke told her audience at one point, adding that "nothing can replace the presence of caring and committed teachers and school administrators."

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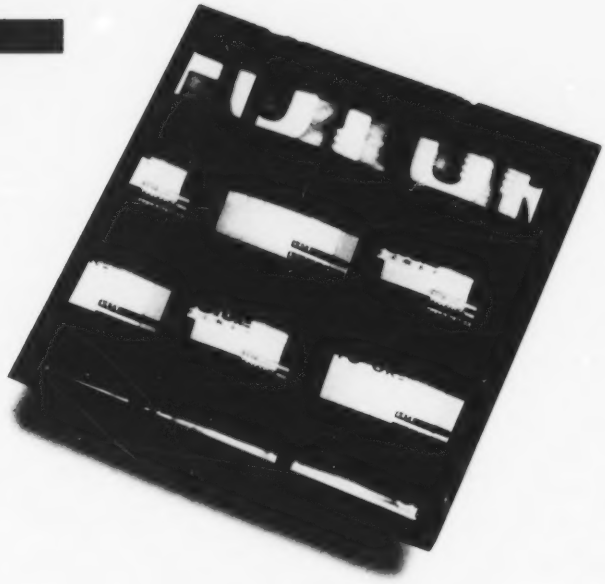

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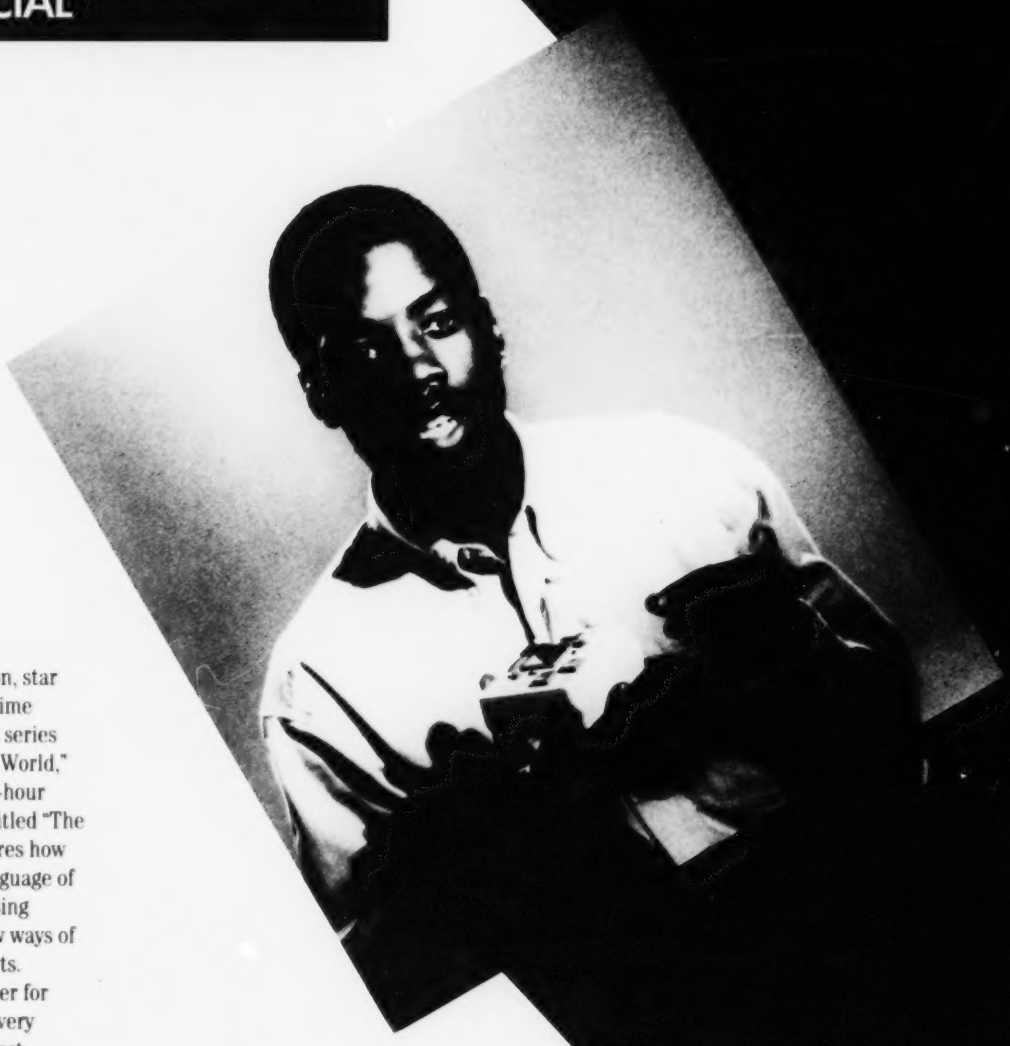

Kadeem Hardison, star of the prime-time television hit series "A Different World," hosts a one-hour Discovery Channel documentary entitled "The Imagination Machines," which explores how the language of technology is the language of the arts and how arts education is using technology to engage children in new ways of expressing and learning about the arts.

A joint project of the Getty Center for Education in the Arts and The Discovery Channel, the program profiles the most creative minds in the industry, many of whom were speakers at the "Future Tense" conference, and presents the best interactive software. With an emphasis on the new medium's educational potential and its relationship to the arts, the documentary vividly evokes the "interactive revolution" — the marriage of computers, videodiscs, and television — which is generating an impressive array of innovative, interactive learning environments for schools and homes.

"The Imagination Machines" premieres on The Discovery Channel in fall 1991 and will be available on videocassette from the Getty Center for Education in the Arts October 1, 1991. An order form is included at the end of this publication.

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